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Zero Retries is an independent newsletter promoting technological innovation in and adjacent to Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Radios are computers - with antennas! Now in its fourth year of publication, with 2700+ subscribers.

About Zero Retries

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In this issue:

- **Request To Send**
  - Paid Subscribers Update
  - Really Nice Mention of Me, Zero Retries, and IP400
  - Whither (the Cost of) Hamvention?
  - SEA-PAC Next Weekend
- **Hamvention 2025 - Zero Retries Impressions**
  - Pre Hamvention - Micro Center
  - Media At Hamvention
  - Name Badge Recommendation - The SignMan of Baton Rouge
  - Overall Hamvention 2025
  - FlexRadio Aurora
  - FreeDV Radio Autoencoder (RADE)
  - Rhizomatica Mercury Radio Modem Software
  - Kenwood TM-D750A Mobile “Data” Radio
  - Timebot (aka, Virtual Time Nut)
  - MMDVM / Zum Radio
  - Amateur Radio Digital Communications (ARDC)
  - HF Signals zBitx
  - QRP Labs QDX
  - Digirig Mobile and Lite Units
  - BridgeCom Systems BCM-220
  - Meshtastic at Hamvention 2025
  - Amateur Radio on the International Space Station (ARISS)
  - Libre Space Foundation SatNOGS
  - Halibut Electronics EggNOGS
  - Youth On The Air (YOTA)
  - AREDN
  - Turn Island Systems WSPRSONDE
  - AMSAT

    - No Sees…
    - Voice of America Museum
    - Takeaways / Bigger Picture
- **In Person Debut of IP400 Network Project at Hamvention 2025**
- **Zero Retries Boilerplate**
- **Permission for Reuse of Zero Retries Content**
- **Footnotes for this Issue**
- **Comments for This Issue** (redirect to Comments page)

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Paid Subscribers Update

My thanks to **Kurt Geisel N3JTW** for becoming an **Annual Paid Subscriber** to Zero Retries this past week!

Financial support from Zero Retries readers is a significant vote of support for the continued publication of Zero Retries.

# # #

Really Nice Mention of Me, Zero Retries, and IP400

Cale Mooth K4HCK on Amateur Radio Daily - Hamvention 2025 Wrap-Up:

> **Zero Retries and IP400**
>
> IP400 was on display alongside the MMDVM group. It was exciting to not only see this project functioning, but to see it come together in a relatively short time span. Steve Stroh (N8GNJ) and Martin Alcock (VE6VH) have been pushing hard to get to this point and I'm excited to see what the next 6 months bring. But beyond IP400 we had the chance to spend some time with Steve Saturday night and just talk about all kinds of different aspects of amateur radio and technology. We did our best to solve all the problems, from figuring out how to light up dark repeaters to the best path to modernize the premiere publishers of amateur radio content.
>
> No one else is doing the in-depth exploration of cutting edge technology in the world of ham radio like Steve is. Zero Retries should be required reading for all hams interested in the future of ham radio.

I appreciate this and was able to demonstrate IP400 to K4HCK and a number of other developers at Hamvention who could appreciate what they were looking at, and the potential of IP400. And, to correct the record, the current state of IP400 has been in work for only five months - VE6VH and I began working together on IP400 2025-01.

And… I blatantly and unapologetically stole K4HCK's quote for the Zero Retries About page.

# # #

Whither (the Cost of) Hamvention?

Should you go to Hamvention? Is it worth the cost - in travel and the high cost of hotel rooms during "Hamvention Season"? I'll argue Yes, if you're so inclined. It's an amazing experience in total immersion in Amateur Radio. It's some of the most fun you will ever have as an Amateur Radio Operator.

Some bits of advice that will multiply your fun at Hamvention:

- If possible, go with a friend who's technically compatible with your interests in Amateur Radio, especially if you're traveling by car. You'll have some amazing discussions on the way home, and you'll be able to take turns having some Amateur Radio fun on the way.
- Ask questions and initiate conversation with strangers at Hamvention. You'll be amazed at the wonderful conversations that can ensue.
- A mistake I see a lot of people make when browsing an exhibit booth is that they hang back and try to figure things out for themselves, when the booth personnel are literally there to answer questions and help you understand what they're exhibiting.
- Many of those staffing booths make the mistake of letting themselves get monopolized by an individual when there are many others wanting to ask questions. So it's not considered *too* rude to say to the booth staffer, after a respectful interval, "*excuse me, I have a quick question*". That usually gives the booth staffer the hint that they've been monopolized too long.

As a first time "semi-exhibitor" (sharing a booth with the MMDVM Project / ZUMRadio), I'll also posit that if you have a project or product that you want to try to get more widely known, as I did with the IP400 Network Project, there's no better market research / evangelism than showing it off and hearing what people think, in realtime, en masse, at Hamvention. I was impressed enough with the response I receive at Hamvention 2025 to commit Tina KD7WSF and I to be an exhibitor at Hamvention 2026 for Zero Retries and the Zero Retries Digital Conference, and probably IP400 (and other data communications systems for Amateur Radio.

I'm also going to apply for a forum speaking slot for a panel discussion of various advanced Amateur Radio data communications systems, including

IP400, New Packet Radio, MMDVM-TNC, and “Mercury VHF / UHF”.

And… I promise… for really real this time… there will be a book - The Zero Retries Guide to Amateur Radio in the 21st Century, at the Zero Retries booth at Hamvention 2026.

# # #

SEA-PAC Next Weekend

Tina KD7WSF and I will be attending the SEA-PAC 2025 conference in Seaside, Oregon next weekend. This year our attendance will be more relaxed - no booth, no flea market table. I might have just enough time to get some experience with my brand new HF Signals zBitx. Plus I want to try to get an AREDN node together to see what I can access from our hotel room.

I’m on the schedule to give a seminar talk about Technological Innovation in Amateur Radio - more details on that next issue.

# # #

Have a great weekend, especially the Memorial Day Holiday weekend in the US, all of you co-conspirators in Zero Retries Interesting Amateur Radio activities!

Steve N8GNJ

Leave a comment

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Hamvention 2025 - Zero Retries Impressions

By Steve Stroh N8GNJ

Hamvention 2025 was different for me than any previous Hamvention, thanks to Hamvention granting me Media access, and being an exhibitor for the first time. I took lots of photos, and two interviews, but that’s not suitable for an emailed newsletter. I’ll figure out a way to post pictures at a later time, perhaps edit the ***web*** *version of this newsletter post-publication, so check back.*

I recommend Cale Mooth K4HCK’s Hamvention 2025 Wrap-Up. In addition to the nice write up about me and the in-person debut of the IP400 Network Project, he covers a number of areas at Hamvention 2025 that I didn’t get to explore, such as Radio Club of America, and most of his observations in that article are Zero Retries Interesting.

Pre Hamvention - Micro Center

After flying into COL (Columbus International Airport) on Thursday evening, but before heading to my hotel in Xenia, Ohio, I made a quick stop at the Columbus Micro Center. I needed a backup battery for my iPhone as I hoped to take a lot of video, and sure enough they had exactly the unit I needed for a reasonable price. *It’s so refreshing to shop at Micro Center!* Every Micro Center store I’ve been in (and I visit their stores in every city I visit) is clean, well organized, well stocked, and carries Raspberry Pi and other small but interesting stuff. Even Amateur Radio!

BAOFENG
UV-50X2

Photo courtesy of Steve Stroh N8GNJ

Best of all, all Micro Center store personnel I've ever dealt with are knowledgeable, friendly, and helpful. It's cool that Micro Center has a system for tracking that individual personnel helped you find what you're looking for by attaching a unique sticker to your purchase, which gets scanned at the register. That is a sane, reasonable system. I sought out the manager on duty and made my usual plaint that we really, really need a Micro Center in the Pacific Northwest, and they said they were well aware of the interest from the PNW. Then he said something interesting - in starting new stores, Micro Center does so out of internal cash flow - they don't go into debt to start a new store. After watching so many computer / electronics retailers crash and burn in the PNW, including CompUSA, Computer City (Tandy), and Fry's Electronics, I have respect for such a policy. Thus I'll be a bit more patient… but still lodge my request every chance I get.

Media At Hamvention

The process of getting my media credentials at Hamvention was painless. Media has their own well-marked trailer on the perimeter of the Greene County Fairgrounds. I was in and out with my media badge and parking pass (Volunteer lots) in a few minutes. My thanks to the Hamvention 2025 Media staff for being so well organized!

Image courtesy of Steve Stroh N8GNJ

Apparently the Hamvention Media staff get lots of "business" as I saw no less than a dozen folks wandering around Hamvention recording video.

Name Badge Recommendation - The SignMan of Baton Rouge

I sent a last minute request for custom name badges (shown above) for Tina KD7WSF and I to Rick Pourciau NV5A of The SignMan of Baton Rouge while he was on the road to Hamvention. NV5A not only handled the order with good grace, but made improvements to what I requested, and had the order ready for me on Thursday before the event started. NV5A provides great service and a high quality product.

Overall Hamvention 2025

If you attend Hamvention for all 2.5 days (Sunday is only 4 hours), the entire time you'll be in *full saturation of all things Amateur Radio*. For a change, you won't be the odd one out talking about radio technology in any random conversation you strike out with someone you're sharing a bleacher with on a brief break to rest your feet. In fact, that's become one of my favorite things to do when attending a major Amateur Radio event - strike up random conversations with strangers because *any conversation you have will always be something to discuss related to radio technology!*

Between the inside exhibits, forums, enjoying the *cuisine d'fair* from food trucks and food pods, and the (justifiably) world famous flea market, there's more than enough to keep you busy. There are also various external activities on Thursday and in the evenings (such as the TAPR/AMSAT Banquet that I attended). In my opinion, one of the few things Hamvention does poorly is compiling and mentioning external events associated with Hamvention. Thus either you know about external events from "your people"… or you don't.

I think Dayton Amateur Radio Association has the Hamvention event dialed in about as much as possible for an outdoor venue that's otherwise a county fairgrounds. There are three big buildings, and a number of smaller buildings. The commercial exhibits in a tent with grass underneath when I attended in the first Greene Country Fairgrounds Hamvention in 2017 are now replaced by having access to a building on the fairgrounds that was formally used by a business. I think that if there was more indoor commercial space available on the Greene County Fairgrounds, it would quickly be filled up with additional exhibitors.

Hamvention's flea market is *big*, and varied. It can be a tiring to slog through the thick grass to see it all. For the first time in an adult lifetime attending

Hamvention at least three times per decade, I didn't feel compelled to check out the treasures available in the flea market. I was told by a friend that *the pro tip* for least painful success in Hamvention Flea Market is the simple expedient of getting a flea market spot just to secure early access to the Hamvention flea market on Thursday and thus not have to compete with the general attendees. Of course this is an old trick of Amateur Radio flea markets in general, but it's never more applicable given the *sheer scale* of the Hamvention flea market. The most experienced folks I saw in the flea market were pulling garden wagons with high sides with wide balloon tires.

I wasn't too temped to browse the Hamvention 2025 flea market because N8GNJ Labs is full-to-bursting of such "future projects" acquired at Amateur Radio flea markets. Thus the need for the **Zero Retries Store** - *please help me downsize…* and at this point it would be absurd to acquire more Amateur Radio flea market ephemera to add to a project queue that I don't have sufficient lifetime to complete. Not to mention that the IP400 Network Project will consume my available project time for the remainder of 2025 and probably beyond.

But it wouldn't be an Amateur Radio event if I didn't find and purchase at least one item of used (new to me) data communications… or what I thought was data communications equipment. I bought a box I knew nothing about that had a BNC antenna connector and a DSUB-9M connector, and it turns out it's a Pyramid Communications DVR-200 "μP controlled, synthesized low power vehicle repeater", though mine does not look like the unit pictured on the website. Mine has a single label - "UHF". Thus it's yet another project for the queue at N8GNJ Labs, though this one has no particular urgency other than a bit of curiosity about what it can do.

But at least Hamvention 2025 dodged the Ohio Spring rains during the event hours, though there was a severe thunderstorm and a lot of rain on Friday evening. But it was also slightly windy, which dried things out, so the ankle deep mud that I experienced in the flea market in 2017 was mercifully absent. I didn't see any of the "Hamvention infamous" mud pits forming in the grass parking areas that in some previous Hamventions (around Hara Arena) required the assistance of tow trucks to escape.

I'll list my impressions in rough order of degree of Zero Retries Interesting. I'll discuss the in-person debut of the IP400 Network Project's Ichiban units in a separate article, since *I* can't be objective about that (though I'm happy to accept K4HCK's impressions mentioned above).

FlexRadio Aurora

From my perspective, no other news at Hamvention about advancing Amateur Radio technology came close to the debut of FlexRadio's Aurora series of High Frequency (HF) radios. I'm sure there were new radio features exclusive to the Aurora (nothing leaped out at me in the feature list that was Zero Retries Interesting). What wowed *me* was the stunning power efficiency compared to other Amateur Radio high power HF radios. This certainly isn't the first use of high efficiency LDMOS circuitry in Amateur Radio HF power amplifiers. But the use of LDMOS allowed FlexRadio to combine the radio, a *500 watt transmitter*, antenna tuner, and power supply all into one compact unit. It runs cool to the touch, delivers a real 500 watts, and *can be powered from a conventional 120 VAC 15 Amp electrical circuit*.

As with other FlexRadio units, it comes in a version with a front panel and "black box", and can (hopefully[1]) use the very nice FlexRadio Maestro remote front panel. I think that FlexRadio established a new paradigm in Amateur Radio with that efficiency - 500 watts when it's useful, dial back the power when it's not needed, and the entire unit runs cool and integrated, rather than the assemblage with lots of connecting cables and fussy integration, of radio, amplifier, tuner, and power supply. Kind of like Apple did with their M series processors for the Mac, establishing astonishing compute performance per watt of electrical power.

While I was in the FlexRadio booth, I registered my annual request for a FlexRadio VHF / UHF Software Defined Radio with Steve Hicks N5AC, the Chief Technical Officer of FlexRadio. He receives these annual requests and acknowledges, with good grace, that such a unit is a good idea.

FreeDV Radio Autoencoder (RADE)

I met Mooneer Salem K6AQ on Thursday (one of the few successes of my early Media admission on Thursday) and he demonstrated FreeDV RADE. Not only is it impressive to hear how clear RADE can be for transmitting a human voice under crap HF band conditions (I was hearing a recording), but even more impressive to learn that it needs just 1.5 kHz of bandwidth to do so. That's a breakthrough in efficient use of HF bands.

Then K6AQ dropped the really impressive bit - the demo he was using at Hamvention was running on a *Raspberry Pi 5* rather than a Windows PC. In a few communications discussing FreeDV on the HF Signals zBitx, K6AQ was skeptical that FreeDV could run on the Raspberry Pi Zero 2 W that is used in the zBitx, and certainly FreeDV RADE could not run on it, but he thought that FreeDV RADE could run on a Raspberry Pi 5. Now he has proven that FreeDV RADE can in fact run, and run well, on a Raspberry Pi 5.

That, to me, graduates RADE from "interesting development project" to practical use case because the Raspberry Pi 5 is affordable ($80 for 8 GB RAM) and could be implemented in a "RADE appliance" using the Raspberry Pi 5 Compute Module. When you transition an application that requires an expensive desktop computer into a single board computer that can be used as an appliance, you radically broaden the usability and audience for that application.

I didn't get to attend the HF Digital Modes Forum to hear more about FreeDATA, and when I mentioned FreeDATA to K6AQ, he didn't know much about it and indicated there was no work underway to make FreeDV RADE and FreeDATA interoperable - send either digital voice, or data, using the same (family of?) application.

To me, no integration between FreeDV (and RADE) and FreeDATA is a missed opportunity to make digital / data modes over Amateur Radio HF even more impressive and usable.

Rhizomatica Mercury Radio Modem Software

Rhizomatica was one of the speakers invited by ARDC for their forum, and apparently Rhizomatica's Mercury radio modem software is ready for actual use. One of the Rhizomatica personnel promised to talk to me in detail, but whenever I approached Rhizomatica's pop up booth, they were busy talking to others (they were quite popular). As I recall their talk, they've achieved their primary goal of Mercury being a drop in replacement for using VARA HF software as a robust, high performance, tuned-for-HF-use modem. It's worth noting that Rhizomatica's use case for Mercury isn't Amateur Radio, but rather using HF as a very thin Internet pipe, to allow exchange of Internet email, text messages, etc. for very remote, very poor communities. As per the link, Mercury is open source, so I would guess that it won't be long until someone / some group forks it to add features requested for Amateur Radio, like a Graphical User Interface (GUI) front panel.

In the brief Q&A after the ARDC presentations, I asked about using Mercury for higher bandwidth (wider channels, thus faster data transfers) use on VHF

/ UHF (akin to the different apps and capabilities of VARA HF versus VARA FM). As I recall, the Rhizomatica folks said that higher performance use on VHF / UHF channels was certainly doable, but wasn't their use case, thus they haven't done much work with Mercury for use on VHF / UHF.

Rhizomatica had a popup booth (that ARDC vacated from moving into a larger booth that was vacant) and (when they were in the booth) it was always busy; I couldn't get in to talk to anyone.

Kenwood TM-D750A Mobile "Data" Radio

As is usual of late, Kenwood showed a TM-D750A concept radio, static display, under glass at their booth. The booth personnel just wouldn't talk much about the features (to me) other than that its feature set was largely based on the Kenwood TH-D75A portable radio. I was told that there is a YouTube video at Hamvention 2025 that got additional details about the TM-D750A, but I don't currently have a pointer to that video.

One feature about the TM-D750A that the Kenwood personnel were willing to talk about was the front facing speaker in the control panel unit. When asked if the microphone could be connected to the control panel unit (instead of the radio unit), the answer was no, the microphone can only be connected to the radio unit. This illustrates how little signature features of a such a radio are being discussed, especially the data capabilities. Hopefully more salient details emerge as the summer progresses and the two other big Amateur Radio conferences are held.

That kind of tells me that the cable connecting the control panel unit is using the same low data rate communications used in the TM-D710 and the TM-V71A, because if that communications cable was carrying Ethernet, there would be more than enough bandwidth to carry the microphone signal from the control panel unit to the radio unit. The booth personnel stated that the TM-D750A would be available in 2025.

I left a Zero Retries Digital Conference brochure with the Kenwood booth personnel, and they indicated some interest. If ZRDC 2025 attendees would like to see Kenwood attend ZRDC 2025, please let Kenwood know that directly.

Timebot (aka, Virtual Time Nut)

Cale Mooth K4HCK in Hamvention 2025 Wrap-Up - AI and Amateur Radio:

> The other point is not as widely known. The TAPR booth was showing off a project from the Time-Nuts (aka Time Lords) in which the entire Time-Nuts email mailing list (going back 30 years) was combined with additional Time-Nuts documentation and indexed by an LLM. The result was a locally running instance of an AI assistant capable of returning answers relevant to any question related to precise time keeping. Hopefully this tool will be available to a wider audience, soon. We're likely to see more examples of libraries of information being made available in similar fashion.

I had a brief conversation with John Ackermann N8UR about this project which he calls Timebot. But, I didn't see this demonstration during my visits to the TAPR booth on Thursday and Friday (it was set up on Saturday). While I'm not a Time Nut, I can appreciate the magnitude of the accomplishment. From a followup email with N8UR:

> The timebot knowledge base currently includes:
>
> - About 110,000 public time-nuts mailing lists,
> - Almost 3500 PDF files from places like NIST, HP (manuals and app notes), and conference proceedings
> - Five time-nuts oriented web sites.
>
> The point is that there are multiple sources for the knowledge and that adds tremendously to the power.
>
> The source code is under MIT license and it's currently on github, though I'm doing a lot of cleanup so it's not quite ready for prime time yet. It's designed so that it could be used for another expert system with little more than changing the "branding."

I have imagined such a thing (a focused AI bounded to specific content) for Amateur Radio information contained in Digital Library of Amateur Radio & Communications (DLARC). For example, if I ever ~~get~~ *allocate* enough time… it would be *so much fun* to be able to ask questions of a virtual Wayne Green W2NSD based on his extensive editorials over multiple decades in 73 Magazine.

Thus, I asked N8UR if the frameworks of his Timebot project were applicable to other domains, such as packet radio, and he said ***absolutely!*** (But he disclaimed that he would not be the one to do such work.)

This is exactly the kind of thing that would be an invaluable service for ARRL - a virtual mentor, that would index *all the content of all ARRL publications* and ARRL members are then able to ask open ended questions. Which is why ARRL, in my opinion, should be willing to work with Digital Library of Amateur Radio & Communications to digitize the numerous ARRL publications that are out of print and have no digital versions, and ARRL isn't willing to make available themselves.

If you'd like to see Timebot in action, you can request a login at https://timebot.febo.com (I discovered there's some glitch using Apple Safari to sign up but Firefox works fine). If you're not a Time Nut, please be respectful in requesting access and using Timebot because bandwidth and compute power for Timebot aren't free, and the priority for Timebot resources should be the Time Nuts community.

MMDVM / Zum Radio

First, my thanks to Jim Mclaughlin KI6ZUM of ZUMRadio for graciously sharing the MMDVM / Zum Radio booth with me to demonstrate the IP400 Network Project (again, more about that in the next article). Jim was gracious to a fault about the booth sharing arrangement.

KI6ZUM was showing off various prototypes of future MMDVM hardware, including a unit that had a powerful enough DVSI CODEC chip to be able to do any digital voice mode to any digital voice mode transcoding. He was also displaying a unit that is I+Q based, which (with software and a host computer) could also do FM as just another voice mode. The MMDVM booth was rarely not busy with ample interest in using MMDVM radio hotspots, especially for use by folks separated by distances such as grandson and grandfather to both use their Amateur Radio portables to chat between themselves.

Of particular interest to me, now that the MMDVM Project states that they've received a second grant from ARDC to continue development on

MMDVM, there is again active development underway on the MMDVM-TNC data mode. Because it's relatively easy to refit an FM repeater to use MMDVM and thus offer digital voice modes, it's encouraging that MMDVM-TNC data modes could be "just another mode" on an "MMVDM repeater". Also the ZUMRadio MMDVM Pi will remain in production for the immediate future.

Amateur Radio Digital Communications (ARDC)

ARDC had a nice booth (courtesy of an exhibitor that couldn't attend at the last minute). They seemed always busy and were giving away nice, and cool T-Shirts…

Image courtesy of Steve Stroh N8GNJ

… almost like they'd been reading my two articles in Zero Retries 0201 - **Amateur Radio Isn't Having All The (Radio) Fun** and **New Types of New Amateur Radio Operators… and Their Expectations** 😀

That is a t-shirt that I will wear proudly and happily evangelize ARDC and its mission to help fund experimentation in those communities (when I'm not otherwise evangelizing Zero Retries). There was another ARDC t-shirt with

Learn Experiment Do

… also pretty cool!

And yet another clever turn of phrase by ARDC was a sticker:

NO NAT
— — — — —
JUST NET
free IPv4s for hams * ampr.org

ARDC booth personnel talked about ARDC grants and 44Net. I was able to talk to John Burwell KI5QKX, 44Net Program Manager, about the 44Net VPN project (soon!). When I discussed that I wanted to put my "network" of (soon) three IP400 units on the Internet with static 44Net IP addresses for developers to experiment with before getting their own units, KI5QKX said that was a great application for 44Net. I said that I'm just not competent (diligent enough, really) to admin my own server on the Internet and thus I was waiting for the availability of the 44Net VPN Service. KI5QKX said "well, let's fix that now" and I now have (I think) access to the beta 44Net VPN. Between travel and catching up after getting back home, and some minor website issues (probably from using Safari as my primary browser) I haven't yet been able to get into 44Net VPN, but I haven't really tried troubleshooting it yet. But soon!

ARDC also hosted a great seminar which showcased several of their funded projects including Rhizomatica and MMDVM.

HF Signals zBitx

HF Signals had a booth at Hamvention selling zBitx units over the counter. I was told they sold out the entire inventory that they brought to Hamvention. No surprise - no shipping, no fraught with peril customs or tariff worries, no five week lead time, etc. Not to mention you could go shopping for all of the other accessories you might want such as antennas, 16550 batteries, power supply, etc. at Hamvention.

I tried to have a conversation with HF Signals Founder (and recently, ARDC Board Member) Ashhar Farhan VU2ESE, but he was constantly mobbed.

It was really really fascinating to see the dichotomy of HF band Software Defined Radio directly on display at Hamvention 2025 with the zBitx at the low end, and the FlexRadio Aurora at the high end.

My zBitx is still waiting in N8GNJ Labs to be unboxed and tried out. One of my first chores is to arrange for some 16550 batteries and a suitable power supply, and then figure out an antenna and understand whether I need a tuner or not.

QRP Labs QDX

QRP Labs had a booth at Hamvention and was selling, among other things, the QDX Digital Transceiver:

> The "QDX" (QRP Labs Digital Xcvr): a feature-packed, high performance, five-band (80, 60, 40, 30 and 20m) or six high-HF band (20, 17, 15, 12, 11 and 10m) 5W Digi-modes transceiver kit, including embedded SDR receiver, 24-bit 48 ksps USB sound card, CAT control, synthesized VFO with TCXO reference. QDX transmits a SINGLE SIGNAL, it is not an SSB modulator with associated unwanted sideband and residual carrier, or intermodulation due to amplifier non-linearity. QDX outputs a pure single signal.

On Sunday, my friend Scott Honaker N7SS was at the QRP Labs booth as I was passing by and N7SS waved a demo QDX at me and said "**Look Steve, a**

black box SDR!" So I *had* to look, and the photos on the website don't do justice to how small this unit is. It's a tiny SDR all right, and initially I thought it was powered by USB-C (don't know where I got that impression), but it's connected with a USB-A port and a 2.1 mm barrel power connector. QRP Labs was selling QDX kits, with the enclosure, for $69 and I said Yes. They asked which one:

- 80, 60, 40, 30, 20m
- 20, 17, 15, 12, 11 and 10m

Having a bit of "Hamvention Mad Money" left in my wallet, I said *both*. Hans Summers G0UPL and N7SS told me that the QDX kit is easy to assemble. Thus I've added *another two items* to my "try to get this project done in Summer 2025" queue in N8GNJ Labs, but definitely behind the zBitx.

Digirig Mobile and Lite Units

Digirig was not on the Hamvention 2025 vendor list, so I was surprised to encounter their booth. I've known of Digirig for years now, but seeing photos and descriptions of "tiny" doesn't prepare you to see an audio interface the half the size of one's thumb (well, my big paw's thumb, anyway). Half the value of the Digirig mobile is the amazing selection of customized interface cables available from Digirig to be able to create a very clean installation of a modem plus radio. But the Digirig Lite, integrated into a cable, is barely bigger than a data cable with radio frequency suppression ferrite filters. The "compact" design of the Digirig is truly amazing.

BridgeCom Systems BCM-220

BridgeCom Systems was an exhibitor at Hamvention 2025 and I was able to talk to Ron Kochanowicz KC0QVT about their BCM-220 219-225 MHz mobile radio that works well for data use because of the flat audio connection available on the BridgeCom BCM-xxx radios (the -144 and the -440 have apparently been discontinued). KC0QVT confirmed that BridgeCom Systems has BCM-220s in stock (a reasonable quantity - I won't quote him on the number he told me). However, the BCM-220s they have in stock *do not include microphones*. If you really want a BCM-220 with a microphone, they're listed on the website for $87. I think the "no microphone" configuration is ideal for data use because the BCM-220 can be programmed with a programming cable and software (still available) and data use tends to be a single frequency. Thus for data use, the microphone isn't needed.

Despite having them in stock, the BCM-220 isn't listed in BridgeCom's Mobile Radio section (thus, no link). I suggest contacting BridgeCom Systems sales and asking about the BCM-220 and tell them "Ron said you have plenty in stock, but without microphones".

Note the frequency range of the BCM-220 - ***219***-225 MHz. This is the only (that I'm aware of, other than a Software Defined Transceiver) off-the-shelf *Amateur Radio* unit that can operate in the Amateur Radio secondary allocation at 219-220 MHz.

It's only my impression - I'm not quoting KC0QVT… but I suspect that when the BCM-220s sell out this time, BridgeCom Systems won't order another batch. So, if you want a good solid data radio for 222-225 MHz, or 219-220 MHz, which will easily do 25 kbps with VARA FM, buy one (or more) now before they're gone forever.

And, for those who say that the TYT radios for 222-225 MHz can be modified for data use, yes, but I've heard varying reports about how those radios hold up for data use. I can attest that the BCM-220 radios are built well, to reasonable specifications, and provide good, reliable service for data use. I have two myself and I wish I had the budget to buy a few more to create my own test data networks with different modems.

Meshtastic at Hamvention 2025

My thanks to my friend Ren Roderick KJ7B for the loan of his Meshtastic Lilygo T-Deck Meshtastic unit. KJ7B even loaded it with the special firmware for Hamvention 2025. I owe KJ7B a beer or two for the loan, and shipping it to me in time for me to take it to Hamvention.

I did get the unit out, and stared at it for the few moments when I wasn't otherwise occupied with walking the exhibits and demonstrating IP400… but I confess I didn't get to know the device or use it much at all. That was a combination of total unfamiliarity with it and Meshtastic, fatigue, and short timespans that weren't otherwise occupied. Thus I'll defer to Cale Mooth K4HCK for a Meshtastic at Hamvention 2025 report:

> One of the more exciting pieces of technology that I was anxious to see in action was the amateur radio adjacent Meshtastic project. They even had a special firmware set up just for the convention. However, I was somewhat disappointed in the lack of activity. While it worked well and I was able to exchange a couple messages, there just weren't that many nodes. Maybe 2 dozen or so? I was expecting exponentially more. I'll be curious to hear what others experienced.

I can say that I did see a fair number of folks walking around with Meshtastic "radio only - no display" units clipped to their backpacks. I think *that* configuration is more my speed - a dedicated radio unit talking to my mobile device set to reasonable contrast and brightness for my particular vision preferences.

Amateur Radio on the International Space Station (ARISS)

ARISS had a nice booth that always had a crowd in the several times I went by it.

One of the best bits from Hamvention 2025 was a conversation that was told to me about a young child with their parents. The child was asked if they were interested in Ham Radio and they said "No". But when the child was told that Ham Radio Operators can talk to the astronauts on the International Space Station, the child perked up and said "You can really talk to *astronauts*?" *That's* the power of ARISS - getting people (not just kids) personally interested in Amateur Radio and space technology, because ***space****… is just cool!*

To those who aren't aware of Amateur Radio, *my absolute favorite boast about Amateur Radio* is that there are two Amateur Radio stations aboard the International Space Station. That always gets notice when I say that with pride, especially to techies.

Libre Space Foundation SatNOGS

Speaking of space… Libre Space Foundation was exhibiting their SatNOGS project (Satellite Network Open Source Ground Station) and plans to offer full kits for participating in SatNOGS. I thought I got a photo of their table, but it's actually a video which I don't have time to scrub to find a screenshot. Suffice it to say that I was impressed with Libre Space Foundation and I think making a full kit available for building a SatNOGS station will accelerate

the project and expand the SatNOGS network a lot faster than “piecemealing” a SatNOGS station.

Halibut Electronics EggNOGS

Halibut Electronics was also at Hamvention selling EggNOGS (Eggbeater satellite omnidirectional antennas) kits… which were sold out by the time I got back to the booth on Saturday. An EggNOGS antenna with a SatNOGS station is yet another “Summer 2025 project” for N8GNJ Labs.

I was surprised that despite the overlap of their missions and products, at the time I talked to Libre Space on Thursday… I think… they weren’t aware of Halibut Electronics’ EggNOGS antenna. Perhaps by now that’s been corrected.

Youth On The Air (YOTA)

The importance of Youth on the Air was emphasized this year by the Hamvention Award for The Amateur of the Year Award Neil Rapp WB9VPG, who is the co-founder and Camp Director of YOTA.

Until recently, I had not paid much attention to Youth on the Air, but I had a conversation with Neil Rapp WB9VPG at HamSCI 2025, and again at Hamvention 2025, and I’m impressed with him and with Youth on the Air. There’s no digital / data focus in YOTA’s activities (that I’ve seen, though I have not studied it deeply) but YOTA is all about actively involving youth in Amateur Radio (D’oh - it’s the group’s *name*) and thus YOTA is focused entirely on the future of Amateur Radio. So YOTA deserves some attention and mention in Zero Retries, and perhaps we can get some more “digital / data” focus into YOTA’s activities.

AREDN

Amateur Radio Emergency Data Network (AREDN) was represented at Hamvention by Miami Valley Microwave Alliance (MVMA). I wish I had seen their booth fully staffed and populated, but the first time I went by they were busy setting up, and the second time I went by their booth, they were tearing down. But it’s fantastic that Zero Retries Interesting projects like AREDN were being shown at Hamvention.

Turn Island Systems WSPRSONDE

Paul Elliott WB6CXC of Turn Island Systems was displaying the WSPRSONDE at the TAPR booth. I’ve mentioned this unit in previous issues of Zero Retries, but it was cool to see it in person, and it is as pretty a unit in person as it is in photos.

AMSAT

AMSAT had a section (not just a couple of booths) at Hamvention 2025, but the times I visited there were only two people staffing it. I asked about the proposed PACSAT (Packet Radio Satellite) and the satellites which will include microwave and Software Defined Radio and the two folks that there there had no idea and said I’d have to talk to someone else who wasn’t at the booth.

No Sees…

It’s a testament to the scale of Hamvention that it’s easy to miss certain vendors that you would have like to have seen. In my (not exactly methodical) passes through the five exhibit buildings, I don’t recall seeing these vendors that were listed as having booths:

- Airspy US (didn’t show, graciously allowed ARDC to use their double booth)
- Alinco
- Amateur Television Network

Voice of America Museum

Despite it being practically in Cincinnati, a visit to the National Voice of America Museum of Broadcasting was well worth the 45 minutes or so drive from Xenia. The VOA Museum had special Hamvention hours, open until 21:00 and so with little to do Saturday evening, I made the trip.

When I walked in, I joked to the staff that I knew I was in the right place for a radio geek when the unique smell of aged, vintage electronics hit me just inside the doorway. (It’s not an objectionable smell… just unique.) The staff smiled and said they knew exactly what I was talking about.

The VOA Museum was a primary broadcast site for VOA shortwave broadcasts until it was decommissioned as a US Government facility (complete with security fencing, around the clock security staff, etc.) When it was decommissioned, all the antenna facilities (including some really impressive towers) were taken down as being too hazardous. The electronics facilities in the building were all left in place and are available for visiting and checking out up close. Such a big broadcast facility is really amazing, and I’ll definitely visit the VOA Museum again in future Hamvention visits.

Takeaways / Bigger Picture

Walking around Hamvention, with all of the activity and many, many varied ways to participate in Amateur Radio, you might be forgiven for thinking that Amateur Radio is perceived as a declining activity… except that the attendees are mostly older. But I saw a lot of families with Moms and Dads checking out the various Hamvention exhibits, and many kids seemed interested and enthused - more than I’ve seen at any other event.

I heard an interesting perspective that digital voice Coder / Decoders (CODECs) will soon be obsolete now that FreeDV is proving out their Radio Auto Encoder (RADE) machine learning technology for digitizing, compressing, transmitting, and recreating human voice. What’s impressive is (as I understand it) the machine learning is training itself on each individual voice, so all those expensive algorithms, all that modeling, all that digital signal processing that goes into a proprietary CODEC is obsolete.

We’ve seen such trends before where we “waste bits”. Research In Motion (Blackberry) wasn’t scared (at first) of the original iPhone because they had done such a stellar job of conserving bits of data over the older mobile telephone networks… until 3G mobile networks began to provide broadband

speeds (at great expense, until people began being willing to pay for such capacity).

It'll be awhile before we have RPi 5 class embedded processors in common use to more fully enable RADE (and other such compute-intensive technologies), but clearly this era of embedded machine intelligence doing not just a CODEC function like RADE, but many others. At the West Mountain Radio booth, I was given a demonstration of the CLRspkr ClearSpeech DSP Noise Reduction Speaker and it was impressive… and that was a "simple" DSP application. We've only begun to scratch the surface of how much difference this class of compute power embedded into radio technology will make in how we *use* radio technology… and how much more useful and capable it will become for us.

I've said before that Amateur Radio has taken on a lot of projects and technologies that for various reasons didn't quite make it. Sometimes the groups or companies just weren't up to the task, or succeeded for a while and just couldn't sustain. In other cases, the technology of the era just wasn't up to the task. My favorite example of this is that we had continent-spanning (in theory, anyway) mesh networks in Net/ROM and TheNET, but the technology just wasn't quite up to it because the computers (TAPR TNC-2s for Net/ROM and DOS PCs for TheNET) just weren't up to managing networks that complex, and the data speeds were too slow for many hops. We don't have those problems now, and we could rebuild such networks with the technology we now have.

Attending Hamvention 2025 made me a lot more hopeful about a Zero Retries Interesting future for Amateur Radio.

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In Person Debut of IP400 Network Project at Hamvention 2025

By Steve Stroh N8GNJ

The first in-person demonstrations of the IP400 Network Project, with the designed for purpose hardware - IP400 Ichiban, took place at Hamvention 2025, 2025-05-16 thru 18 in Xenia, Ohio, USA.

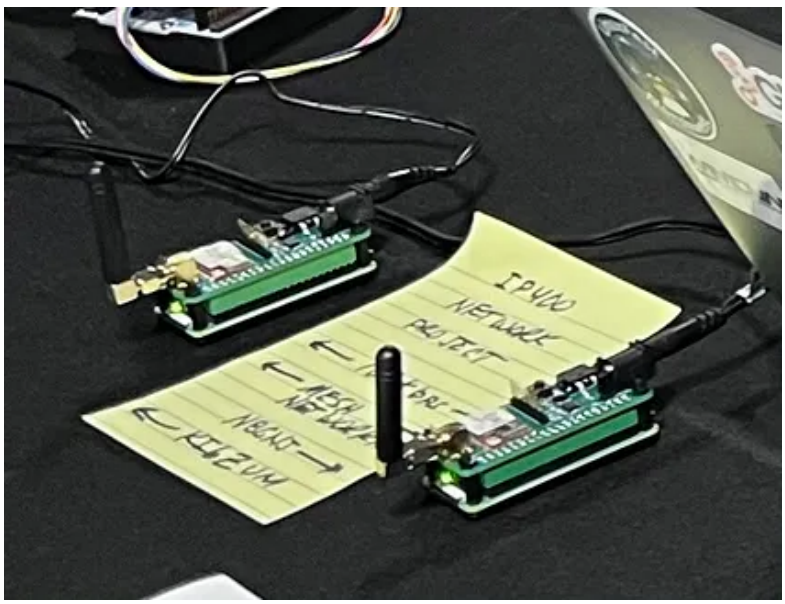

Image courtesy of Steve Stroh N8GNJ

To those that didn't know what they were looking at (the majority of those who visited the MMDVM / ZUMRadio table) at Hamvention 2025, the public debut of the IP400 Network Project was inauspicious.

But to those that did know about IP400, this modest demonstration was pretty impressive.

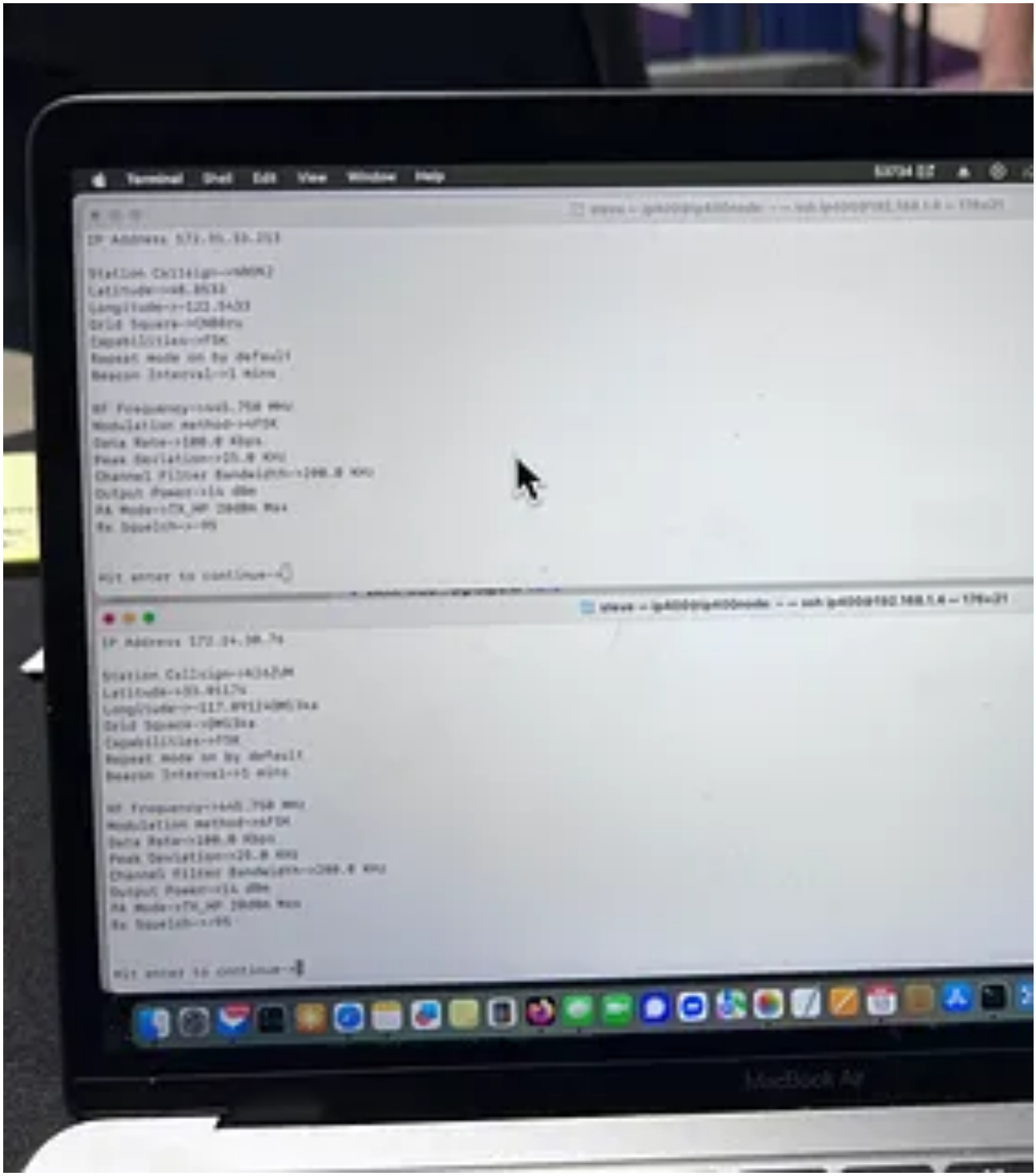

Image courtesy of Steve Stroh N8GNJ

What was demonstrated was the culmination of months of hard work by Martin Alcock VE6VH.

What was most impressive to me, finally getting hands-on of near-production IP400 Ichiban hardware running on a Raspberry Pi Zero 2 W host, *is that it did everything VE6VH said it would do*. **It works!** With a careful eye and some background knowledge, the potential is obvious. All the "bones" are there for impressive future development built on a strong foundation. All of the radio parameters are settable from a simple menu (or soon, from an application talking to the radio). IP400 units beacon a lot of parameters to other nodes on the channel so you know what their capabilities are. The included chat system works to demonstrate just how wicked fast 100 kbps is.

All that said, what was shown of IP400 Ichiban at Hamvention 2025 was a demonstration… a down payment on what is to come. Like some of the other diminutive units that I described in the previous article, IP400 Ichiban is also tiny, but that tininess belies the capabilities it has such as the first real breakthrough in higher speed data communications in the Amateur Radio VHF / UHF band since the WA4DSY 56KB RF Modem.

There were some technical issues to be overcome, including the PC laptop that I'd lugged from Bellingham to be the primary display for IP400… failed to

boot up - no disk found. Fortunately I had my faithful MacBook Air M1 also with me. I'd not have any hands-on with the units until Hamvention and configuration was a bit tricky, but by Friday mid-afternoon I was capably demonstrating that each of them were hearing each other's BEACON broadcasts, and the built-in chat application was demonstrating that they were in fact communicating with each other over the air.

Several developers who saw IP400 clearly understood the potential and were quite excited and vowed to get some IP400 Ichiban's on order to begin experiencing and developing.

A steady stream of those who had heard about IP400 from various information channels (not always Zero Retries) were curious to see IP400 "in action" found their way to the MMDVM / ZUMRadio booth. The small stock of literature I brought with me was gone by the end of the day Friday - one of many lessons learned about doing demonstrations on the scale of Hamvention.

Another lesson learned was that I didn't have nearly enough answers ready for the technical parameters of the system, especially a handout with the information developers would need to know to work with IP400.

Yet another lesson learned is that IP400 (perhaps shared with Zero Retries) should have had its own exhibit table to be able to spread out, use multiple computers, a larger monitor, and a slide show running in the background… and lots of different, and a large quantity of handouts for those that are curious. My daughter Merideth KK7BKI advised "Dad - have QR codes!". *She's right, that.*

The best part is that the two IP400 Ichiban units came home with me to N8GNJ Labs in Bellingham, WA and a third will soon arrive so that I can do some mesh networking demonstrations and testing and some show and tell videos for publication. With these units I'll also be able to provide much more useful feedback to VE6VH and the other developers of IP400, including the operation, features, bugs, and documentation.

As mentioned about ARDC in the previous article, I hope to put the IP400 Ichiban units online for remote developer access via the 44Net VPN in the near future.

Stay tuned to the IP400 email list, and the IP400 website for updates on IP400.

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Tina Stroh KD7WSF for, well, *everything!*
Jack Stroh, Late Night Assistant Editor Emeritus
Shreky Stroh, Late Night Assistant Editor In training

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Footnotes for this Issue

To see the relevant sentence for the footnote, just click the footnote number.

1

The Maestro section says "Maestro Control Console for the FLEX-6000/8000". It would be really unfortunate planning if the Maestro wasn't compatible with Aurora radios.